

REMARKS

In view of the foregoing amendments and the following remarks, Applicants respectfully request reexamination of the present application. Claims 167, 170, 171, 177, 178, 186, 187, 193, 194, 203, 204, 209, 210, 219-221, 226, 227, 230 and 231 have been amended, no claims have been cancelled and new Claims 233-235 have been added. Support for new Claims 233-235 can be found at page 44 of the present specification and in original Claim 138.

CLAIM REJECTIONS – 35 USC § 112

The Examiner has rejected Claims 167-217 and 229-231 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

First, the Examiner states that at the end of Claim 167, the term “the selected composition” lacks proper antecedent basis. Applicants have amended the preamble of independent Claim 167 to recite that the method is for making particles of a selected particle composition. Therefore, removal of this rejection under 35 USC § 112 is requested.

Second, the Examiner states that it is unclear what step(s) would or would not be encompassed by the terms “batch initiation operations” and “batch termination operations”. Based on lines 16-18 of Claim 167, the Examiner states that it would appear that the only required steps of these operations are commencing generation of an aerosol stream and ceasing generation of the stream, respectively, and lines 7-8 of that claim indicate that generating of the stream is part of some “intermediate operations”. The Examiner’s position is that the prior art, which includes the defined “intermediate operations”, would inherently include the batch initiation and batch termination operations, since commencing and ceasing of the stream would inevitably occur in any process in which the intermediate operations take place.

The Examiner correctly states that the only *required* steps of these operations are commencing generation of an aerosol stream and ceasing generation of the stream, as recited in Claim 167. It is well settled that during patent examination, the pending claims must be given their broadest reasonable interpretation consistent with the specification. *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). The broadest

reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. *In re Cortright*, 165 F.3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999). However, the breadth of a claim is not to be equated with indefiniteness. *In re Miller*, 441 F.2d 689, 169 USPQ 597 (CCPA 1971). If the scope of the subject matter embraced by the claims is clear, and if Applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 USC § 112, second paragraph (MPEP 2173.04).

In this light, the Applicants agree with the Examiner's assessment that the batch initiation operations and batch termination operations can encompass many steps. (See, for example, pages 40 and 41 of the present specification). The Examiner's position that the prior art includes the defined intermediate operations and would inherently include the batch initiation and batch termination operations is discussed below. However, Applicants respectfully submit that in view of the foregoing precedent, *these grounds are not sufficient to reject the claims under 35 USC § 112, second paragraph* and removal of this rejection is requested.

Third, the Examiner states that Claims 219-221 appear to be incomplete, i.e., they do not define complete process steps or recite complete sentences. As a result, no prior art was applied against Claims 219-221, as no reasonable estimation could be made of the scope of these claims. Applicants have amended each of these claims to define complete process steps (i.e., that the processing step in question "is interrupted"). Therefore, removal of this rejection under 35 USC §112 is requested.

INVENTION SUMMARY

The present invention is directed to an automated method for fabricating particles of a selected particle composition. Aerosol methods such as spray pyrolysis have been used to make a variety of small particles and also to deposit thin films onto substrates. However, most of these systems have been experimental in nature and unsuitable for commercial particle production. As a result, many such systems do not provide any mechanism to adequately control the process parameters such as the quality of the aerosol, efficient use of the carrier gas and efficient collection methods that are necessary for commercial production by these methods. The present inventors conceived the

method(s) of the present invention for controlling the production of particles, particularly on a commercial scale.

CLAIM REJECTIONS – 35 USC § 103

The Examiner has rejected Claims 167-170, 172, 174, 182-186, 191, 195-203, 205-207, 218, 222, 223, 225, 226, 228 and 232 are rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 3,840,391 by Spitz et al.

The Examiner states that Spitz et al. discloses using an ultrasonic generator to force a uniform aerosol including droplets of an aqueous solution of a metal compound and a carrier gas into a heated zone, where the heat causes droplets of the solution to vaporize. The Examiner also states that the droplets are of a size as presently claimed (Col. 3, lines 18-24).

With respect to the "automatically controlled at the direction of an electronic processor" limitation, the Examiner's position is that the electrical circuitry which turns the ultrasonic generator of the prior art on and off fully meets this limitation. The Examiner also states that with regard to the various functions that are "automatically" controlled, commenced, etc. in the instant claims, Spitz et al. discloses varying such parameters as power, frequency, concentration of aerosol, flow rate of gas, etc. to produce desired results; any changes in these parameters in order to better control the resulting products are held by the Examiner to fall within the scope of the various "automatic" steps as presently claimed. It is the Examiner's opinion that one of skill in the art would want to control such parameters in an efficient manner, and the use of electronic sensors, switches, etc. would provide a far greater degree of control than could possibly be achieved through manual observation and operation.

Spitz et al. form a film using the above process, as opposed to the presently claimed forming of particles. However, the Examiner notes that Spitz et al. (Col. 3, line 10) indicates that one conducts the process in order to obtain a mean particle size of a few microns. The Examiner further states that the present claims do not define any particular size of any particles formed in the claimed process, and performing the Spitz et al. process on a small area of a substrate would involve forming a "particle" within the broad meaning of the term in the instant claims. Thus, the Examiner states that a prima facie case of

obviousness is established between the disclosure of Spitz et al. and the presently claimed invention.

Applicants respectfully traverse this rejection. All words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Since it is not disclosed otherwise, the ultrasonic generator of Spitz et al. is presumed to be turned on and off manually. There is no evidence that Spitz et al. utilizes an electronic processor processing instructions to control an operation during the production of particles. The basis for the rejection of these claims according to the Examiner is that the "automatically controlled at the direction of an electronic processor" limitation is fully met by whatever electrical circuitry turns the ultrasonic generator of the prior art on and off. However, Spitz et al. does not disclose or suggest any electrical circuitry that is *automatically controlled at the direction of an electronic processor processing instructions* for the manufacture of the particles of the selected particle composition. That is, Applicants submit that any "electrical circuitry", which turns the ultrasonic generator of the prior art on and off, does not fully meet this limitation since such electrical circuitry is not *automatically controlled at the direction of an electronic processor processing instructions for the manufacture of particles*.

The Examiner also states that Spitz et al. discloses varying such parameters as power, frequency, concentration of aerosol, flow rate of gas, etc. to produce desired results. First, Applicants note that Spitz et al. merely discloses that a variable power piezoelectric generator can be used and that the mean diameter of the droplets decreases as a function of the frequency of the ultrasonic generator. This property of ultrasonic droplet generation is well known. Nonetheless, there is nothing in Spitz et al. that suggests automatically controlling this variable, or any other, at the direction of an electronic processor that is processing instructions for the manufacture of particles having a selected particle composition.

With respect to dependent Claim 169, there is nothing in Spitz et al. that discloses or suggests automatically commencing a supply of the precursor liquid to the aerosol generator at the direction of an electronic processor. With respect to dependent Claim 172, there is nothing in Spitz et al. that discloses or suggests automatically commencing a supply of carrier gas at the direction of an electronic processor. With respect to dependent

Claim 174, there is nothing in Spitz et al. that discloses or suggests automatically increasing temperature within the aerosol heater at the direction of the electronic processor. Indeed, Spitz et al. does not even disclose or suggest an aerosol heater, but only a heated substrate upon which the droplets are deposited.

Dependent Claim 182 recites that an operation during the *intermediate operations* is automatically controlled at the direction of the electronic processor. The Examiner's assertion is that electrical circuitry, which turns the ultrasonic generator of the prior art on and off, meets the limitation of Claim 167. In addition to the discussion above, this rationale clearly does not apply to control over *intermediate* operations of the method for making particles. For example, dependent Claim 183 recites that the feed rate of the carrier gas to the aerosol generator is controlled during generating of the aerosol stream at the direction of the electronic processor. Dependent Claim 184 recites control of the feed rate of the liquid precursor to the aerosol generator during the generating of the aerosol stream at the direction of the electronic processor. Control over these intermediate operations by an electronic processor is not disclosed or suggested by Spitz et al. Dependent Claim 191 recites automatically controlling heat input to the aerosol heater at the direction of the electronic processor. Again, Spitz et al. does not disclose or suggest an aerosol heater, let alone automatic control over this intermediate operation.

With respect to independent Claim 218, this claim recites that the step of generating the aerosol stream is automatically interruptible at the direction of an electronic processor processing instructions for the manufacture of the particles. As is discussed above, Spitz et al. does not disclose or suggest interrupting manufacture *at the direction of an electronic processor* that is processing instructions for the manufacture of the particles.

With respect to independent Claim 223, this claim recites that one or both of the feed of the liquid precursor to the generating step and feed of carrier gas to the generating step is automatically controlled at the direction of an electronic processor processing instructions for manufacture of the particles. Automatic control of these variables by an electronic processor is not disclosed or suggested by Spitz et al.

The Examiner has also rejected Claims 180 and 213-217 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. The Examiner admits that Spitz et al. does not disclose automatically testing a flow path of the aerosol stream for leaks prior to generating

the stream, as required by Claim 180. The Examiner's position is that one of ordinary skill in the art would be motivated to include such a step in any process which involves the use of aerosolized solution in order to avoid (i) potential waste, and (ii) potential spills of toxic chemicals and solutions in processes of the prior art. The Examiner states that it is axiomatic that one would desire to be assured that the equipment that is to be used in a given chemical process will be capable of properly performing the functions intended. Therefore, to incorporate the presently claimed pressure testing step prior to commencing the operations as described by Spitz would be considered an obvious modification of what is disclosed by Spitz et al.

The Examiner also states that although Spitz et al. does not specify the various numerical limitations of Claims 213-216, processes including these limitations would fall within the purview of the Spitz et al. process, especially with regard to Claims 215 and 216 in light of Spitz et al. at Col. 3, line 10. In this regard, Applicants note that Claim 215 recites an average size for the particles, and the production of particles is not even disclosed by Spitz et al.

With respect to Claim 217, the Examiner states that the use of multiple generators in the same manner as the use of one generator in the prior art, to achieve nothing more than a cumulative and predictable effect thereof, cannot be said to define a patentable distinction from the prior art process.

Thus, the Examiner states that the Spitz et al. disclosure is held to establish a *prima facie* case of obviousness of these claims as well.

As is discussed above, Spitz et al. does not disclose or suggest performing such an operation at the direction of an electronic processor as part of the batch initiation operations. With respect to dependent Claim 217, the Examiner states that the use of multiple generators cannot be said to define a patentable distinction from the prior art process. However, the Examiner has provided no line of reasoning as to why one of ordinary skill in the art would be motivated to provide additional ultrasonic generators based upon the disclosure of Spitz et al., particularly in the context of the present invention. That is, the use of multiple generators is desired for the production of commercial quantities of particles, and it is this embodiment which most benefits from the methods of the present invention. Therefore, removal of this rejection is also requested.

The Examiner has rejected Claims 171, 177, 178, 187, 193, 194, 204, 209, 210, 227, 230 and 231 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al.

The Examiner states that Spitz et al. does not disclose the spray nozzle atomizer, flame reactor, or plasma reactors as recited in the instant claims. The Examiner states that such does not distinguish the claimed invention from the prior art because all of these claims are directed entirely to apparatus limitations, and as such cannot serve to patentably distinguish the claimed process from the same set of process steps performed in the prior art; compare *In re Sweeney* (72 USPQ 501). Thus, the disclosure of Spitz et al. is held to establish a prima facie case of obviousness of the presently claimed invention.

In view of the foregoing, Applicants have amended these claims to recite process steps. Further, Spitz et al. does not disclose the use of these types of atomizers and reactors, as has been recognized by the Examiner. Therefore, removal of this rejection is also requested.

The Examiner has also rejected Claims 171, 187, 204 and 227 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 4,801,411 by Wellinghoff et al.

The Examiner states that Spitz et al. does not disclose the apparatus limitations (now process limitations) recited in the instant claims. The Examiner states that Wellinghoff et al. indicates that the use of spray atomizers was an art recognized equivalent at the time of the invention to the use of the ultrasonic generators as described by Spitz. The Examiner notes the comparison of the two systems in Wellinghoff at Col. 4, line 43 through Col. 8, line 68. The Examiner states that therefore, at a minimum, the combination of Spitz et al. and Wellinghoff et al. would have taught the claimed invention to a person of ordinary skill in the art.

However, each of these claims depend upon an independent claim, which is discussed above. Wellinghoff et al. does not remedy the shortcomings of Spitz et al. with respect to the disclosure of any type of automatic control at the direction of an electronic processor processing instructions for the manufacture of particles. Therefore, removal of this rejection is also requested.

The Examiner has also rejected Claims 177, 193, 209 and 230 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 5,852,768 by Jacobsen et al.

The Examiner states that Spitz does not disclose the limitations recited in the instant claims. The Examiner states, however, that Jacobsen et al. indicates that it was known in the art to employ flame reactors as heaters in conjunction with a process of forming powders of uniform particle size from ultrasonic generators, i.e., in a process analogous to that of Spitz et al. Thus, the Examiner states that the combination of Spitz et al. and Jacobsen et al. would have rendered a process as presently claimed obvious to one of ordinary skill in the art.

The Examiner states that the process of Jacobsen et al. is analogous to the process of Spitz et al. However, Applicants respectfully point out that Jacobsen et al. is directed to the manufacture of powders and Spitz et al. is directed to the manufacture of a coating on the substrate. It does not appear that a flame reactor would even be useful in the method of Spitz et al. One of skill in the art would not be motivated to provide a flame reactor as a heater in conjunction with the process of Spitz et al. Therefore, removal of this rejection is requested.

The Examiner has also rejected Claims 175, 179, 181, 188, 189, 190, 211, 212 and 224 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 5,928,405 by Ranade et al.

The Examiner states that Spitz et al. does not disclose the use of cooling gas in order to cool the material produced in the Spitz et al. process. The Examiner also states that Ranade et al. indicates that it was conventional in the art, at the time of the invention, to employ cooling gases to cool powders produced from aerosol thermolysis of a solution, i.e., from a process analogous to that of Spitz et al. The Examiner states that all statements made *supra* with response to one or more parameters being "automatically" controlled apply equally as well in this instance. The Examiner also states that the combination of Spitz et al. and Ranade et al. would have taught a process as presently claimed to a person of ordinary skill in the art.

However, Spitz et al. is directed to the formation of a *coating on* a substrate. No particles are collected by the process of Spitz et al. and therefore there would be no

motivation to provide a cooling gas to cool the particulate product as it is produced, as is suggested by the Examiner. Therefore, removal of this rejection is also requested.

The Examiner has rejected Claims 176-232 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-104 of U.S. Patent No. 6,699,304 by Hampden-Smith et al.

The Examiner states that although the conflicting claims are not identical, they are not patentably distinct from each other because both the instant claims and the '304 claims are directed to processes of making particulate products by heating of an aerosol stream produced from an ultrasonic generator. The Examiner also states that while the '304 do not refer to any of the steps that are performed "automatically" as recited in the instant claims, the Examiner's position is that the act of turning the power on and off to the ultrasonic generators of the '304 claims, and/or of controlling the temperature of the heater and amounts of the aerosol and carrier gas in the '304 claims amount to "automatic" control of these parameters in a broad sense as required by the instant claims. The Examiner states that thus, no patentable distinction is seen to exist between the process as defined in the instant claims and that defined in the claims of the '304 patent.

Applicants respectfully traverse this rejection. The Examiner states that the act of turning the power on and off to the ultrasonic generators or controlling the temperature of the heater and amounts of the aerosol and carrier gas amount to "automatic control of these parameters". However, as is discussed above with respect to Spitz et al., these steps do not amount to automatic control of these parameters *at the direction of an electronic processor processing instructions for the manufacture of the particles*. Therefore, removal of this rejection is requested.

Applicants have added new Claims 233-235. These claims recite that the electronic processor selects and processes instructions from memory having the instructions stored therein for the manufacture of the particles. Clearly, the operation of turning the switches on and off, which is suggested by the Examiner to be equivalent to the automatic steps of the present invention, is not equivalent to and does not provide the advantages of a microprocessor reading instructions from a memory for controlling the manufacture of particles.

Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecute and or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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